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ABSTRACT

The Board of Education of the Houston Independent School District, through the Volunteers in Public Schools, organized the Kindergarten Screening Project in 1970. The Kindergarten Screening Instrument (KSI) consists of five sub-scales: (1) the visual scale measures visual acuity at 20 feet; (2) the hearing scale measures the child's ability to hear tape recorded words; (3) the eye-hand coordination scale indicates the coordination of visual perception and fine muscles; (4) the language learning scale is a measure of language development in the child's primary language; and (5) the gross motor scale measures the use of large muscles in coordinated body movement. Both English and Spanish versions are available. This technical manual presents data on the reliability of the KSI (split-half reliability, internal consistency, test-retest reliability, inter-scorer reliability, and its validity (content validity, criterion-related predictive validity, criterion-related concurrent validity, construct validity, convergent, and discriminant validity). Information is also included on norms, intercorrelation of the subtests, and referrals by sex and ethnic group. (Author/BW)

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Kindergarten Screening Instrument

TM006 618

Technical Manual
Continuing Revision Number 6
Project of Volunteers in Public Schools (VIPS)
Houston Independent School District
3830 Richmond Avenue
Houston, Texas 77027

Revised

Technical Manual for the Kindergarten Screening Inventory Based on Data from the 1975-76 School Year

Eugene B. Doughtie

Herbert L. Alston

PREFACE

The Kindergarten Screening Project of the Houston Independent School District was begun in 1970 by approval of The Board of Education. The task from its inception was and remains a project of the Volunteers in Public Schools. The task outlined by the original advisory committee involved establishing the capability to identify children who might experience difficulties in the educational process immediately upon their first contact with school, at the kindergarten level, before those possible difficulties interfered with the learning process and before a pattern of failure had an opportunity to become established. In addition to establishing the capability to identify children who might need help, the goals were to screen every child entering kindergarten (12,000 to 14,000) each year and to refer to the appropriate professional all children with a possible difficulty identified for further evaluation and appropriate attention. All of the screening and referral system was envisioned as being accomplished by the Volunteers in Public Schools which is a group of interested and energetic unpaid contributors to the educational process. This group, mostly mothers and grandmothers over 2,000 strong in the screening group alone, have acted in unbelievable concert with the able assistance of the Junior League of Houston and with the direction and support of Jean Davis Myers, the one certificated professional in the group, toward the accomplishment of the stated task.

The first screening instrument used in 1970 and 1971 was based on standard items or items identified from clinical data. For 1972 a major revision was accomplished with revisions in each of the succeeding years based on empirical data and appropriate statistical analysis. The manual which follows is based on data from the 1975 instrument (Continuing

Revision Number 5). Our intention is to publish a revised manual each year until a stable version of the Kindergarten Screening Instrument (KSI) is completed so that those who want to know will have benefit of our experience in an ongoing process.

The current manual is not complete since the sample for test-retest information is small and not representative. In addition, no follow-up data were available since the district up to now has not had student identification numbers for kindergarten children. A numbering system has been devised and was put into use this fall. For next year we should have the first follow-up data collected on a representative sample.

For help in collecting and analyzing data we want to thank the VIPS, Program Analysis and Evaluation, and the HISD Computer Center personnel. For all their ideas, effort in training and general support, we want to thank the Physical Education, Health Services and Special Services Departments of the Houston Independent School District. Special thanks also to Mrs. Virginia Leach who typed the manuscript along with the numerous tables and got them all right.

Eugene B. Doughtie

Herbert L. Alston

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1. INTRODUCTION

1.1 Description of the KSI

The Kindergarten Screening Instrument consists of five sub-scales and attempts to screen for possible difficulty in the areas of distant vision, hearing, eye-hand coordination, language-learning, and gross motor performance. All scales are administered in the child's primary language. Both English and Spanish versions are available.

The visual scale measures visual acuity at 20 feet. Children are referred for acuity of less than 20/40 in either eye with glasses.

The hearing scale measures the child's ability to hear tape recorded words. Words are from different frequency ranges representing everyday listening situations and presented at 40 decibels (Sound Proof Level) from a distance of three feet with both ears. Children are referred for audiometric examination if they are unable to understand words at this level and distance.

The eye-hand coordination scale yields an indication of coordination of visual perception and fine muscles. The scale predicts difficulties in the use of tools such as pencils, crayons and scissors so necessary in a school environment.

The language-learning scale is a measure of language development in the child's primary language. The scale includes both concrete naming items and more abstract preposition and analogies items.

The gross motor scale measures the ability to utilize large muscles in body movement in a coordinated manner. The scale ranges from static and dynamic balance to items measuring total body coordination.

The first two scales, vision and hearing, have definite criteria for referral. The last three eye-hand, language-learning and gross motor have

statistical criteria for referral based on judgment. These criteria are therefore likely to change as more is learned about the relationship of the latter three factors on school performance.

1.2 Purposes of the KSI

There are several purposes for academic screening at the kindergarten level. The primary purpose is to identify children who may experience difficulty in the educational process before the difficulty is experienced and before a pattern of failure has an opportunity to become established. When early identification is made, referral to the appropriate school or private professionals for evaluation and possible remediation is accomplished very early in a child's academic career. For example in the short history of Kindergarten Screening, literally hundreds of children were referred to visual specialists for eye examinations. Large numbers of these children needed eye-glasses and neither the child's parents nor school personnel had recognized the need. The same has been true of children with other difficulties. Secondary purposes yet to be served involve predicting performance in the first few years of school and evaluating the importance of eye-hand coordination, language-learning and gross motor factors on future tasks (e.g., learning to read).

1.3 Description of the HISD Kindergarten Population

The Houston Independent School District is the sixth largest in the United States. The school district includes White, Black and Mexican-American children in approximately the same percentages as the kindergarten population reported in Table 1. The Other category listed in the Table represents all those persons who categorize themselves in other than the three major groups listed above. Most of the children labeled as Other are either Oriental or American-Indian.

Table 1

Sex and Ethnic Group Composition of HISD Kindergarten Students (Fall 1965 Data)

(N = 12,703*)

Ethnic Group	Male	Female	
Anglo-American	16.2	15.5	31.7%
Mexican-American	12.9	12.6	25.5%
Negro-American	20.3	21.3	41.6%
Other	.6	.6	1.2%
	50.0%	50.0%	

*Percentages based on 12,703 students for which sex and ethnic group data were available. Total number was 13,174.

Although 13,1[illegible] protocols were available for analysis, most of the analyses were based on a random sample of 1,790 children in order to conserve computer time and ease in data handling. Chi square analysis revealed no differences between the sample and the total population for either sex or ethnic group.

1.4 Test Administration by VIPS

The Kindergarten Screening Instrument (KSI) was designed to be administered and scored by interested lay persons with a minimal amount of training. In a few hours a volunteer with excellent skills in relating to young children can acquire the necessary technical competence to administer and score any of the sections of the instrument.

The entire instrument has been and continues to be administered and scored by volunteers. The purpose is to free the school's professional staff to devote their time to the children who need them most.

1.5 Purpose of the Technical Manual

In general, the purpose of a technical manual for an instrument used in assessment is to provide data on the characteristics of the instrument including reliability and validity data so that potential users of the instrument are able to make a judgment as to the possible effectiveness of the tool for the purpose desired.

Most technical manuals are read only by statisticians and are not at all understandable to the teachers, principals, and other school personnel who most need to make decisions that affect children. We have tried to write in a verbal style understandable to teachers and at the same time present data that the methodologically sophisticated will find acceptable.

In general, the manual has considered the recommendations of the joint committee on standards of the American Psychological Association, the American Educational Research Association and the National Council on

Measurement in Education and published as Standards for Educational and Psychological Tests (APA, 1974). Our intention is to revise and expand the manual annually as additional data become available.

1.6 Changes in the Technical Manual

At this date the manual is not complete because the KSI is not complete and because adequate and representative data for several types of analyses are not yet available. What follows is a consideration of the reliability, validity and other data analysis of the 1975 edition of the KSI.

The first Technical Manual was written in 1975, and this is the first revision of that manual. This edition contains the following additional information not contained in the original edition: (a) standard scores and percentile tables for each sex and ethnic combination, (b) additional concurrent validity data, and (c) a comparison of the number of referrals from Mexican American students tested in English, Spanish or both.

The only analysis not repeated is intercorrelation of factor defined subtests. Follow-up data for planned studies of the predictive validity of the KSI are not yet available.

2. RELIABILITY

2.1 Definition

Two basic issues in the evaluation of a measurement instrument are the accuracy with which the test measures the construct or constructs it was designed to measure and the accuracy of repeated measurements of whatever constructs the test in fact measures. The first issue is the issue of validity. The second is the issue of reliability.

As stated, reliability refers to the accuracy with which an instrument measures something for repeated measurements, that is, it refers to the reproducability of the results (Magnusson, 1966). More precisely, reliability has traditionally been defined as the correlation between performance on two parallel forms of a test (Gulliksen, 1950; Kuder & Richardson, 1937).

The basic assumption of classical test theory is that the observed score is the sum of the true score and an error score. Error scores are assumed to be random. Consequently, the correlation of the error scores with the true scores is zero, the correlation of the error scores on one test with the error scores on a parallel test is zero, and the mean of the errors is zero. Therefore, the variance of the observed scores is equal to the variance of the true scores plus the variance of the error scores.

$$S_x^2 = S_t^2 + S_e^2$$ where S_x^2 = the total observed variance

S_t^2 = the variance of the true scores

S_e^2 = the error variance

2.2 Concepts of Reliability

Reliability, however, refers to more than one concept. One concept of reliability is that of <u>equivalence</u>. If two parallel forms of a test

were administered at the same point in time, the correlation coefficient obtained between performance on the two tests would be a measure of their equivalence. Another concept of reliability is that of stability over time. If two parallel tests were administered at different points in time, the correlation coefficient obtained would be a measure of both equivalence and stability over time. A third concept of reliability is that of internal consistency or the homogenity of a test. Other things being equal, the greater the internal consistency of a test, the greater its computed reliability. This is the case, assuming that error variance is a constant, because the total variance is sum of the item variances plus two times the item covariances and the item covariances will be a maximum when the test is homogenous. A fourth concept of reliability is scorer reliability. Scorer or inter-scorer reliability refers to the agreement between two or more testers concerning the performance on a test by a group of subjects. Each of these concepts of reliability is typically conceptualized in terms of correlation coefficients, but reliability is similarily conceptualized in terms of variance. Reliability has traditionally been defined as the proportion of true variance. That is, reliability is the ratio of the true variance to the observed variance ($r_{xx} = s_t^2 / s_x^2$). This is equivalent to the correlation coefficient between two parallel forms of a test.

More recently Cronbach et al. (Cronbach, 1970; Cronbach, Rajaratnam & Gleser, 1963) have introduced another concept of reliability. They propose the concept of generalizability to replace the traditional concepts of reliability. The observed scores are considered to be a sample from a universe of possible test scores for any defined domain of interest, and a person's true score is defined as the mean of his test scores for the

defined domain. The sample score is the basis for generalizing to the universe score. This conception of reliability differs from the more traditional concepts of reliability by emphasizing the components of variance involved in reliability estimates and by emphasizing that a subject has a true score on each defined domain. The generalizability coefficient is estimated by the intraclass correlation coefficient and may be based on any of the sources of variance referred to by the traditional types of reliability. All these concepts of reliability are similar, however, factors which contribute to error variance for one measure may contribute to true variance for another measure (Guilford & Fruchter, 1973). Some of these relationships and commonly used procedures for estimating reliability are summarized in Table 2 (Anastasi, 1968; Cronbach, 1970; Guilford & Fruchter, 1973; Magnusson, 1966).

Table 2

Types of Reliability

Type of Reliability Coefficient	Type of Conceptual Reliability	Some Sources of Error Variance
Parallel Forms (Immediate)	Equivalence of forms	Content sampling
Parallel Forms (Delayed)	Equivalence and stability	Time sampling and content sampling
Split-half	Internal-consistency	Content sampling
Kuder-Richardson	Internal-consistency	Content sampling and content heterogeneity
Alpha Coefficient	Internal-consistency	Content heterogeneity
Test-retest	Stability over time	Time sampling
Inter-rater	Consistency of scoring	Scoring differences

2.3 Reliability of the KSI

2.31 Split-Half Reliability

The split-half reliability coefficient was computed for the KSI by the Spearman-Brown formula for the items composing the three major subtests, except for the language used item and adequate-inadequate summary scores. The twenty-two items used were assigned to test halves on the basis of whether they were odd or even. Last year the correlation coefficient obtained between the two half tests computed on a random sample of 1,538 students was .713 and the Spearman-Brown reliability coefficient was .832. This year the coefficients on a sample of 1,790 students were .779 and .876. These reliability coefficients may be considered an estimate of the equivalence of the two half tests corrected for length or equivalence of content sampling.

2.32 Internal Consistency

The internal consistency or homogeneity of the KSI was estimated by computing the alpha coefficients (Cronbach, et. al., 1967; Cronbach, 1970) for the three major subtests and for the items in these three subtests combined. The formula used was

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\text{Sum } S_i^2}{S_t^2}\right)$$

where n = the number of items,
S_i^2 = the item variances,
S_t^2 = the total variance of the group of items.

The alpha coefficients for the Eye-Hand Coordination, Language Learning and Gross Motor subtests, as well as for the total of the items constituting these subtests, may be seen in Table 3 for a sample of 1,790 students and by sex and ethnic groups. The alpha coefficients may be considered estimates of internal consistency or the extent to which each

Table 3

Alpha Coefficients

KSI	Sample					
	Total	AA	MA	NA	Male	Female
	N = 1790	N = 628	N = 414	N = 729	N = 902	N = 888
Total	.840	.798	.830	.851	.840	.840
EHC	.842	.796	.819	.831	.854	.821
LL	.802	.723	.802	.780	.791	.791
GM	.600	.540	.624	.612	.588	.624

group of items measures a single factor.

2.33 Test-Retest Reliability

Last year a small sample of students was available for retesting with the 1974-75 version of the KSI. Ninety-two students at Kolter Elementary School were readministered the KSI after one week. Another sample of 92 students at Durham Elementary School were retested after approximately three weeks. Neither sample of students is thought to be particularly representative of students in general in the Houston Independent School District. One reason these samples are not thought to be representative is the small number of students who scored inadequate on the KSI subtests. This restriction in the range of performance reduced the size of the test-retest reliabilities reported in Tables 4 and 5. The test-retest reliabilities for the total score were .517 and .326 for the two samples, and the subtest reliabilities ranged from .326 to .695. The test-retest

reliabilities for the items in each subtest can be seen in Tables 4 to 11. Although these reliability coefficients were reduced by restriction in the range of performance on the test, they may be considered as estimates of stability over time. The corrected coefficients are presented in the next section.

A small sample of students were retested with the 1975-76 version of the KSI this year at Cornealius and Blackshear elementary schools. The administration of the pretest at Cornealius was not satisfactory and thus only the results obtained on the kindergarten children retested at Blackshear are reported. The test-retest reliabilities for the total, EHC, LL and GM scores were .71, .61, .83 and .32 respectively. The test-retest reliabilities for the items in each subtest of the 1975-76 version of the KSI can be seen in Tables 12 to 15.

2.34 Test-Retest Reliability Corrected for Restriction in Range

As previously stated, one reason to expect that the test-retest reliability coefficients were reduced in size was the restriction in the range of performance on the KSI by the retested groups of students. Few of these students received inadequate summary scores on the KSI. The test-retest reliability coefficients were corrected for restriction in range by use of the following formula (Thorndike, 1951, p. 595):

$$R_{11} = \frac{r_{11} + r_{12}\left(\frac{\sigma_2^2}{s_2^2} - 1\right)}{1 + r_{12}\left(\frac{\sigma_2^2}{s_2^2} - 1\right)}$$

where R_{11} = the corrected reliability coefficient,

r_{11} = the reliability coefficient for the restricted group,

Table 4

Total and Subtest Test - Retest

Reliabilities for Group A

1974-75 Version of the KSI

(N = 92)

Scales	Test-Retest Correlation	Significance Level
Eye Hand Coordination	.695	.000
Language Learning	.447	.000
Gross Motor	.386	.000
Total	.517	.000

Table 5

Total and Subtest Test - Retest

Reliabilities for Group B

1974-75 Version of the KSI

(N = 92)

Scales	Test-Retest Correlation	Significance Level
Eye Hand Coordination	.508	.000
Language Learning	.380	.000
Gross Motor	.347	.001
Total	.326	.002

Table 6

Test-Retest Reliabilities for

EHC Items for Group A

1974-75 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.241	.021
2	.602	.000
3	.326	.002
4	.125	.234
5	.562	.000
6	.430	.000
7	.526	.000

Table 7

Test-Retest Reliabilities for

EHC Items for Group B

1974-75 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.174	.097
2	.445	.000
3	.364	.000
4	.209	.046
5	.459	.000
6	.381	.000
7	.647	.000

Table 8

Test-Retest Reliabilities for

LL Items for Group A

1974-75 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.691	.000
2	.073	.486
3	.742	.000
4	.501	.000
5	.388	.000
6	.342	.001
7	.230	.027
8	.259	.013
9	.460	.000
10	.000	1.000
11	.000	1.000

Table 9

Test-Retest Reliabilities for

LL Items for Group B

1974-75 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.571	.000
2	.146	.164
3	.677	.000
4	.364	.000
5	.369	.000
6	.308	.003
7	.393	.000
8	.159	.131
9	.569	.000
10	.000	1.000
11	.000	1.000

Table 10

Test-Retest Reliabilities for

GM Items for Group A

1974-75 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.781	.000
2	.607	.000
3	.436	.000
4	.609	.000
5	.250	.016
6	.202	.054
7	.030	.778
8	.222	.033
9	.564	.000
10	.402	.000
11	.298	.004
12	.439	.000

Table 11

Test-Retest Reliabilities for

GM Items for Group B

1974-75 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.760	.000
2	.607	.000
3	.436	.000
4	.556	.000
5	.235	.024
6	.194	.064
7	.034	.751
8	.194	.064
9	.591	.000
10	.384	.000
11	.298	.004
12	.439	.000

Table 12

Total and Subtest Test-Retest Reliabilities

for the 1975-76 Version of the KSI

Scales	Test-Retest Correlation	Significance Level
EHC	.612	.000
LL	.829	.000
GM	.321	
Total	.707	.000

Table 13

Test-Retest Reliabilities for EHC

Items on 1975-76 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.3757	.000
2	.4522	.000
3	.4567	.000
4	.3303	.014
5	.3027	.023
6	.4028	.000
7	.5337	.000

Table 14

Test-Retest Reliabilities for LL

Items on 1975-76 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.5966	.000
2	.8063	.000
3	.6333	.000
4	.5572	.000
5	.2096	.086
6	.5466	.000
7	.6738	.000
8	.6922	.000
9	.2634	.042

Table 15

Test-Retest Reliabilities for GM

Items on 1975-76 Version of the KSI

Item	Test-Retest Correlation	Significance Level
1	.1946	.103
2	.2212	.075
3	.4576	.000
4	.1126	.233
5	.5434	.001
6	.2438	.055

r_{12} = the correlation between the restricting variable (adequate score) and the variable under study in the restricted group (KSI scores),

σ_2 = the standard deviation of the adequate score in the total HISD kindergarten population,

S_2 = the standard deviation of the adequate score in the retested sample.

As can be seen in Tables 16 and 17, the reliability coefficients were materially increased in size by the correction for restriction in range. It should be noted that the fact that there was no increase in the size of the reliability coefficient for Language Learning in sample B is due to the fact that no one was scored inadequate on that variable. Consequently, there was no variance on that item and the formula could not be used. It should also be noted that there is no total adequate-inadequate score and therefore the adequate-inadequate score for EHC was used to correct the total test-retest reliability coefficients.

For the 1975-76 results no correction for restriction in range was computed since there was no restriction in the variability of the sample as compared with the population on the adequate-inadequate items.

2.35 Inter-Scorer Reliability

Small samples of students were also rated independently by two examiners on the same administration of the KSI to provide estimates of

Table 16

Total and Subtest Test-Retest Reliabilities

Corrected for Restriction of Range for Group A

1974-75 Version of the KSI

	KSI	Test-Retest Reliability	Corrected Test-Retest Reliability
Group A	EHC	.695	.818
	LL	.447	.801
	GM	.386	.513
	Total	.517	.642

Table 17

Total and Subtest Test-Retest Reliabilities

Corrected for Restriction of Range for Group B

1974-75 Version of the KSI

	KSI	Test-Retest Reliability	Corrected Test-Retest Reliability
Group B	EHC	.508	.703
	LL	.380	.380
	GM	.347	.480
	Total	.326	.501

interscorer reliability. Last year one hundred and thirty-four students at Twain and Durham Elementary Schools were double scored on the KSI, and 45 students at Kolter Elementary School were double scored. The inter-rater reliabilities for the total score were .886 and .950, and the inter-rater reliabilities for the subtests ranged from .723 to .970. The inter-rater reliabilities are given in Tables 18 to 22. Data from 46 students in one additional school, West University Elementary, were added this year (see Table 19).

2.36 Standard Errors of Measurement

Another approach to evaluating the reliability of an instrument is the consideration of standard errors of measurement. Standard errors of measurement are typically conceptualized as the standard deviation of a hypothetical distribution of scores that would be produced if an individual were administered equivalent tests several times (Anastasi, 1968; Cronbach, 1970; Guilford & Fruchter, 1973). The standard error of measurement reported for a test is an estimate of the average of the standard errors of measurement for the individuals tested.

The standard error of measurement is assumed to be normally distributed and is used to interpret scores of individuals on a test. For example, if a person made a score of 50 on some test, for which the standard error of measurement was 2, his true score would be interpreted as probably being between 2.58 standard errors above or below his obtained score. That is, it is highly probable that his true score is between 44.84 and 55.16. In the same example, if the standard error of measurement was 4, then it is highly probable that his true score would fall between 39.68 and 60.32. The larger the standard error of measurement the larger the range of values within which the individual's true score probably falls.

Table 18

Total and Subtest Inter-Rater

Reliabilities for Group C

(N = 134)

Scales	Inter-Rater Correlation	Significance Level
Eye Hand Coordination	.857	.000
Language Learning	.723	.000
Gross Motor	.940	.000
Total	.886	.000

Table 19

Total and Subtest Inter-Rater

Reliabilities for Group D

(N = 46)

Scales	Inter-Rater Correlations	Significance Level
Eye Hand Coordination	.937	.000
Language Learning	.928	.000
Gross Motor	.989	.000
Total	.847	.000

Table 20

Inter-Rater Reliability for

EHC Items for Group C

(N = 46)

Item	Inter-Rater Correlation	Significance Level
1	.6932	.000
2	.9164	.000
3	.7841	.000
4	.9183	.000
5	.9667	.000
6	.8423	.000
7	.9406	.000
8	1.0000	.000

Table 21

Inter-Rater Reliability for

LL Items for Group C

Item	Inter-Rater Correlation	Significance Level
1	.9553	.000
2	.9664	.000
3	.9414	.000
4	.8964	.000
5	.8534	.000
6	.8926	.000
7	.9786	.000
8	.9112	.000
9	.9211	.000
10	1.0000	.000

Table 22

Inter-Rater Reliability for

GM Items for Group C

Item	Inter-Rater Correlation	Significance Level
1	.9733	.000
2	.9792	.000
3	.9648	.000
4	.8976	.000
5	.9942	.000
6	.9973	.000
7	1.0000	.000

The standard error of measurement is computed by the following formula:

$$s.e.m. = s\sqrt{1-r}$$ where s = the standard deviation of the test scores,

r = the reliability coefficient.

The standard errors of measurement for the total KSI score and the three major subtests of the KSI are reported for a random sample of 1,538 students and for sex and ethnic groups for the 1974 group in Table 23. Standard errors of measurement for the 1975 group were based on a random sample of 1,790 students. Data for this group are reported in Table 24. As can be seen from the tables, the numbers for the two groups were essentially similar although standard errors for the 1975 group were slightly but consistently larger.

2.37 Standard Error of Difference

When interpreting the performance of an individual, one may also want to know whether an individual performed significantly better on one subtest than another. This question may be addressed by use of the standard error of the difference between two scores (see Anastasi, 1968; Magnusson, 1966). The standard error of the difference between two scores for the same individual may be computed by the following formula:

$$S_{diff} = \sqrt{s.e.m._1^2 + s.e.m._2^2}$$ where $s.e.m._1$ = the standard error of measurement for one subtest,

$s.e.m._2$ = the standard error of measurement for the other subtest.

Table 23

Standard Errors of Measurement*

1974

KSI	Sample					
	Total N = 1538	AA N = 596	MA N = 347	NA N = 584	Male N = 791	Female N = 747
Total	6.064	5.761	6.142	6.063	6.162	5.910
EHC	2.863	2.736	2.919	2.941	2.841	2.878
LL	2.979	2.675	3.224	3.053	3.034	2.919
GM	3.755	3.831	3.682	3.690	3.794	3.633

Table 24

Standard Errors of Measurement*

1975

KSI	Sample					
	Total N = 1790	AA N = 628	MA N = 414	NA N = 7	Male N = 902	Female N = 888
Total	6.150	5.907	6.426	6.105	6.236	6.049
EHC	3.031	2.850	3.145	3.092	3.033	3.072
LL	3.118	2.878	3.397	3.250	3.223	3.181
GM	3.585	3.797	3.650	3.396	3.597	3.513

*Note: The reliability coefficient used to compute these standard errors of measurement was the alpha coefficient.

The standard errors of difference between the KSI subtests based on the 1975 group are as follows: EHC and LL = 4.344; EHC and GM = 4.695; and LL and GM = 4.751. If two standard errors of difference is used as a criterion to estimate a reliable difference between subtest scores, then such differences will arise by chance only 2.5 percent of the time. This is to say, for example, that a difference of 8.698 between the EHC and LL scores of an individual is very probably a real difference in his level of performance and would occur by chance only 2.5% of the time.

2.38 Interindividual Differences

We may also want to know whether one individual performed significantly better than another individual on the same test. The standard error of interindividual differences may be computed by the following formula (see Magnusson, 1966):

$$Se_{A-B} = S_t\sqrt{2(1-r)}$$

where Se_{A-B} = the standard error of interindividual differences between individual A and individual B,

S_t = the standard deviation of the test scores,

r = the reliability coefficient of the test.

Using the alpha coefficient values as reliability coefficients, the standard error of interindividual differences for the EHC, LL and GM subtests, and the sum of these subtests were computed for a random sample of 1,790 students from the 1975 sample. The obtained values are as follows: EHC = 4.286, LL = 4.410, GM = 5.069, and SUM = 8.698. This is to say, for example, that the standard error of interindividual

differences for the EHC subtest is 4.286 and that a difference in EHC scores for two individuals of 8.572 or larger is highly unlikely to occur by chance.

3. VALIDITY

3.1 Definition

Validity has generally been defined as the accuracy with which an instrument measures the construct or constructs it was designed to measure (e.g., Magnusson, 1966) and more recently in terms of the inferences that can be made on the basis of performance on the instrument. That is, what construct does the test measure and can these construct measurements be used to predict some other category of performance (Standards for Educational and Psychological Tests, 1974). Validity refers to several related concepts and can be assessed in several ways. Four categories of validity typically discussed are content validity, criterion-related predictive validity, criterion-related concurrent validity and construct validity.

3.2 Concepts of Validity

3.21 Content Validity

Content validity refers to the representativeness of the test items to the domain of interest. Content validity is built into a test by defining the domain of interest and then developing the test items to measure the different constructs included in the domain. Content validity is most appropriate for measures of achievement. A test may be said to have content validity to the extent that it can be shown that the test items are representative of the originally defined domain.

3.22 Criterion-Related Predictive Validity

Criterion-related predictive validity refers to the ability to predict performance on some future criterion on the basis of performance on some other instrument. The relationship between performance on the test and some future criterion is usually expressed as a correlation

coefficient or a validity coefficient. For example, we wish to predict performance in the first few grades of elementary school on the basis of performance on the KSI administered during kindergarten. The criterion-related validity of a test depends on the criteria chosen, that is, it depends on the purpose or the inferences that one desires to make on the basis of performance on the test. For example, we wish to identify those students who may have problems with language or with eye-hand coordination tasks in the first grade. Consequently, performance on the Language Learning and Eye-Hand Coordination subtests of the KSI could be compared with a criterion such as reading difficulties in the first grade. If performance on the Language Learning and Eye-Hand Coordination subtests administered during kindergarten predicted reading difficulties in the first grade, then the KSI would be said to have criterion-related predictive validity for that purpose.

3.23 Criterion-Related Concurrent Validity

Criterion-related concurrent validity as contrasted with criterion-related predictive validity indicates the relationship between performance on the test and performance on the criterion at approximately the same point in time rather than at some future point in time. For example, we wish to identify students who may be having trouble while in kindergarten, as well as those who may have trouble later in school. Consequently, performance on the subtests of the KSI could be compared with criteria such as teacher ratings of student performance. If performance on the subtests of the KSI was significantly related to current teacher ratings of student performance, the KSI would be said to have criterion-related concurrent validity for the tasks on which the teachers rated the children.

3.24 Construct Validity

Perhaps the most inclusive category of validation is that of construct validity. It may be considered to include content validity and criterion-related validity, and it emphasizes the relationships among constructs.

3.241 Definition

A psychological construct answers the question of what accounts for an individual's performance on a test (Cronbach, 1970). It is a hypothetical postulated entity and it is defined in terms of its relationship to other such postulated constructs. Such a system of stated relationships among constructs constitutes a theory or a nomological network (Cronbach & Meehl, 1955). By definition, a construct is not synonymous with the operations by which it is measured (Cronbach & Meehl, 1955). This is to say that the same construct can be measured by more than one method, and the relationships among constructs can be assessed by more than one procedure. Construct validation refers to empirical evidence for the postulated relationships among the constructs.

3.242 Convergent and Discriminant Validity

Campbell and Fiske (1959) proposed that a construct should be highly related to some constructs and unrelated to others in a nomological network. This is to say that construct validation requires evidence of convergent and discriminant relationships with other constructs. The method proposed by Campbell and Fiske (1959) for ascertaining the convergent and discriminant validity of a construct involves examining the relationships in a multitrait-multimethod correlation matrix. In brief, validation requires that measures of the same construct by different methods should be more highly correlated than measures of dissimilar constructs by the same method or by different methods.

3.243 Factor Analytic Approaches

Factor analytic procedures have also been proposed for the identification of constructs and their relationships (Guilford & Fruchter, 1973). The logic of convergent and discriminant validity would lead us to expect that tests measuring similar constructs should be highly related and tests measuring dissimilar constructs should have little relationship. That is, tests measuring similar constructs should load on the same factor and tests measuring dissimilar constructs should load on different factors. Criterion measures may be included in the set of test variables factor analyzed. The factors obtained may be considered to be constructs themselves (Royce, 1963) and the factor loading of the test on each factor is the factorial validity of the test. That is, the factorial validity of the test is the degree to which it measures particular factors or constructs. Items in a test may also be factored, and if the items from the same subtest have high loadings on the same factor and low loadings on other factors, this is evidence of the construct validity of the subtests.

3.244 Model Testing Procedure

Wakefield and Doughtie (1973) proposed a model testing procedure which assesses whether a significant number of the relationships predicted by a model conform to the model (e.g., Doughtie, Wakefield, Sampson & Alston, 1974; Wakefield & Doughtie, 1973). In this model testing procedure the test variables are the constructs of interest. In brief, this procedure involves calculating the distances between pairs of constructs in factor space and comparing these relationships to the relationships specified by the theoretical model. If the number of distance comparisons predicted by the theory significantly exceeds the number expected by chance, the construct validity of the theory is

supported.

A number of other procedures may be used to assess construct validity (see Anastasi, 1968). In brief, any theoretical prediction which receives empirical support is evidence of construct validity.

3.3 Validity Information for the KSI

3.31 Content Validity

The assessment of content validity considered as a sample of achievement is probably inappropriate for the KSI, because the KSI was not constructed to be representative of any particular instructional program. The assessment of content validity considered as a sample of possible items to measure the test constructors' concepts of eye-hand coordination, language learning, etcetera is appropriate. In this context content validity refers to subtest homogeneity, that is, the extent to which the items in each subtest are measuring the same construct or related set of constructs. The homogeneity of the subtests may be evaluated by considering the alpha coefficients computed for the three major subtests (see Table 3), by considering the correlation between individual items and the subtest totals (see Tables 40 to 45), and by considering the results of the factor analysis of the KSI items (see Section 3.341 and Table 32). In brief, the alpha coefficients for the three major subtests range from .842 for Eye-Hand Coordination to .600 for the Gross Motor subtest; the correlations of individual items with subtest totals and with other items in the same subtest are moderate to high; and the four factors obtained by the factor analysis of the KSI items are defined by high loadings on the eye-hand coordination, language learning, gross motor and vision items, respectively.

3.32 Criterion-Related Predictive Validity

Follow-up data are not available for students who were administered

the KSI during previous years or this year. Consequently, the criterion-related predictive validity of the KSI has not been evaluated. Since one of the major purposes of the KSI is to identify students who may have difficulty in the first few years of elementary school, it is desirable that procedures be implemented for obtaining follow-up data on a sample of students who will take the KSI. Follow-up data for the 1975 group will be available this fall and results will be reported in next year's manual.

3.33 Criterion-Related Concurrent Validity

Criterion-related concurrent validity data is available for the KSI. Professional ratings of vision, eye-hand coordination, language-learning and gross motor skills were obtained for small samples of students for whom KSI scores were available. The professional ratings on vision and hearing were done by members of the nursing staff. The ratings on language-learning were done by the speech staff and the ratings on gross motor performance by members of the physical education department. Professional ratings were on a 1 to 5 scale for each subtest and based on whatever measures the professional elected to use. As can be seen in Tables 25 to 28, the validity coefficients between professional ratings and the corresponding KSI subtest totals ranged from .309 for the gross motor domain to .600 for eye-hand coordination. Kindergarten teacher ratings of vision, hearing, fine motor skill, language, and gross motor skill were also obtained for small groups of students who were administered the 1974-75 edition of the KSI. A copy of the rating form used by the teachers is included in the appendix. As can be seen in Table 29, the validity coefficients ranged from .237 for language to .486 for eye-hand coordination and fine motor skill.

Table 25

Criterion-Related Concurrent Validity for Vision:

Professional Ratings & KSI
(1974)
(N = 89)

	Vision*			
	PRV	V1	V2	VTot
Professional Rating Vision	1.000			
Vision 1	.504	1.000		
Vision 2	.550	.741	1.000	
Vision Total	.566	.924	.941	1.000

*All correlation coefficients significant ($p < .001$).

Table 26

Criterion-Related Concurrent Validity for EHC:

Professional Ratings & KSI*
1974 Data
(N = 111)

		PREHC	EHC1	EHC2	EHC3	EHC4	EHC5	EHC6	EHCTot
Professional Rating	EHC	1.000							
	EHC1	.373	1.000						
	EHC2	.436	.446	1.000					
	EHC3	.493	.598	.505	1.000				
KSI	EHC4	.523	.367	.408	.567	1.000			
	EHC5	.514	.417	.476	.531	.488	1.000		
	EHC6	.439	.570	.470	.583	.533	.754	1.000	
	EHC Total	.600	.725	.709	.820	.730	.793	.851	1.000

*All correlation coefficients significant ($p < .001$).

Table 27

Criterion-Related Concurrent Validity for LL:

Professional Ratings & KSI
1974 Data
(N = 145)

		L1	L2	L3	L4	L5	L6	L7	L8	L9	LTot	PRL
	L1	1.000*										
	L2	.250*	1.000*									
	L3	.293*	.354*	1.000*								
	L4	.235*	.345*	.431*	1.000*							
KSI	L5	.182*	.280*	.239*	.148	1.000*						
	L6	.121	.303*	.085	.287*	.150	1.000*					
	L7	.194*	.420*	.230*	.174*	.413*	.311*	1.000*				
	L8	.141	.341*	.398*	.260*	.247*	.267*	.410*	1.000*			
	L9	.050	.260*	.268*	.085	.206*	.014	.266*	.234*	1.000*		
	L Total	.442*	.635*	.689*	.555*	.604*	.389*	.606*	.604*	.562*	1.000*	
Professional Rating	L	.121	.263*	.284*	.178*	.083	.259*	.195*	.436*	.104	.344	1.000*

Note: An asterisk indicates that the correlation coefficient is significant at the .05 level.

Table 28

Criterion-Related Concurrent Validity for GM:

Professional Ratings & KSI
1974 Data
(N = 89)

		PRGM	GM1	GM2	GM3	GM4	GM5	GM6	GM7	GMTot
Professional Rating	GM	1.000*								
	GM1	.202	1.000*							
	GM2	.270*	.003	1.000*						
	GM3	.156	.182	.442*	1.000*					
KSI	GM4	.163	.135	.286*	.369*	1.000*				
	GM5	.026	.357*	.030	.045	.328*	1.000*			
	GM6	.274*	.044	.089	-.068	.001	.076	1.000*		
	GM7	.132	.107	-.041	-.055	.015	.205	.120	1.000*	
	GM Total	.309*	.504*	.392*	.419*	.575*	.707*	.377*	.461*	1.000*

Note: An asterisk indicates that the correlation coefficient is significant at the .05 level.

Table 29

Criterion-Related Concurrent Validity:

Teacher Ratings & KSI

(N = 118)

1975 Data

		KSI				Teacher Ratings					
		EHC	LL	GM	Total	V	H	FM	L	GM	Total
KSI	EHC	1.000									
	LL	.482	1.000								
	GM	.206	.319	1.000							
	Total	.747	.757	.728	1.000						
Teacher Ratings	Vision	.044	.150	.235	.197	1.000					
	Hearing	.167	.192	.233	.268	.585	1.000				
	Fine Motor	.486	.426	.394	.585	.311	.221	1.000			
	Language	.138	.237	.121	.214	.580	.721	.313	1.000		
	GM	-.033	.101	.317	.185	.503	.646	.111	.629	1.000	
	Total	.268	.335	.337	.421	.715	.799	.604	.890	.710	1.000

Additional data on the criterion-related validity of the KSI is available on samples of students who were administered the 1975-76 edition of the KSI. One group of kindergarten students was enrolled in a Title I program (HEART) for students from low income families and another group was enrolled in a special program (KPLC) for students in the bottom third of their kindergarten class.

The students enrolled in the Title I HEART program were administered the Cooperative Preschool Inventory (CPI) (Caldwell, 1970) and the Test of Basic Experiences (TOBE) (Moss, 1970) language section. The CPI is a measure of readiness for school and the TOBE score is a measure of language comprehension. In addition, these kindergarten students had been administered the 1975-76 edition of the KSI, and their enrollment in the HEART program was based on either inadequate performance on a KSI subtest or their teacher's recommendation. The relationships between the KSI subtests and the TOBE and CPI scores were investigated by regression analyses.

Scores on the three major subtests (EHC, LL, GM) of the KSI were used to predict the CPI and TOBE scores for a sample of 160 students. There was no significant relationship between the KSI variables and the CPI. There was a significant overall relationship between the KSI variables and the TOBE language scores. The multiple correlation was .46 ($F = 13.7$; $df = 3,156$; $p < .01$). This means that constructs measured by the KSI can account for approximately 21 percent of the variance in the TOBE language scores. The simple validity coefficients were as follows: EHC and TOBE ($r = .26$), LL and TOBE ($r = .41$), and GM and TOBE ($r = .13$). The first two of these correlation coefficients are significant at the .01 level. This means that there is a significant relationship between both the EHC and LL subtests of the KSI and the TOBE language scores.

Correlation coefficients were also computed between scoring adequate or inadequate on Vision, Hearing, Eye-Hand Coordination, Language Learning, or Gross-Motor ability and performance on the TOBE language scale and performance on the CPI. As can be seen in Table 30, the only significant relationships between scoring adequate or inadequate on the KSI and the TOBE and CPI scores were: (a) between the Distant Vision Left Eye score of the KSI and the TOBE language score and (b) between the Language Learning score of the KSI and the TOBE language score. These results are underestimates of the relationships between these variables due to the dichotomous scoring of the KSI variables, restriction of range of performance of the sample tested, etc. The results of the regression of the EHC, LL and GM subtests on the TOBE and CPI scores are a better estimate of the relationships among the constructs. Those results were that there is no significant relationship between the KSI and the CPI, and that there is a significant relationship between the KSI and the TOBE language score based on the significant relationship of the TOBE with the EHC and LL subtests of the KSI.

Table 30

Correlation of Adequate-Inadequate Performance on the KSI and the TOBE Language and CPI Scores*

N = 160

KSI Adequate-Inadequate Score	TOBE Language	CPI
Vision Right Eye	-.11	.00
Vision Left Eye	-.22**	.07
Hearing	.12	-.03
EHC	-.09	-.02
LL	-.38**	-.05
GM	.11	.06

*Note: A double asterisk denotes significance at the .01 level.

Students enrolled in the Kindergarten Precision Learning Center (KPLC) program were administered a criterion-referenced test (CRT) with math and language subtests, and the Wide Range Achievement Test (WRAT) (Jastak & Jastak, 1965) with reading, spelling and math subtests. The KPLC program is designed to build skills necessary for the first grade among children who have been identified by their kindergarten teachers as being in the bottom third of their kindergarten class. The relationships between the KSI subtests and the CRT and WRAT constructs were investigated by regression analyses.

Scores on the EHC, LL and GM subtests of the KSI were used to predict the CRT and WRAT subtest scores for a sample of 41 students. As can be seen in Table 31, there was a significant overall relationship between the KSI subtests and each of the CRT scores and between the KSI subtests and the WRAT mathematics scores. The KSI subtest scores were not significantly related to the WRAT spelling and reading scores.

Table 31
Regression of KSI Subtests on CRT and WRAT
Subtest Scores for KPLC Students

Comparison	Multiple Correlation	F	Significance Level
KSI & CRT Total	.68	10.34	$p < .01$
KSI & CRT Math	.54	4.96	$p < .01$
KSI & CRT Language	.68	10.83	$p < .01$
KSI & WRAT Reading	.35	1.69	NS
KSI & WRAT Math	.58	6.16	$p < .01$
KSI & WRAT Spelling	.40	2.34	NS

Table 31a

Correlation Coefficients Between the KSI Subtests and the CRT and WRAT Subtests for KPLC Students

KSI SUBTESTS	CRT			WRAT		
	Total	Math	Language	Reading	Math	Spelling
EHC	.55**	.49**	.52**	.31	.44**	.36*
LL	.59**	.43**	.62**	.24	.50**	.04
GM	.21	.17	.20	.20	-.03	.14

Note: A single asterisk denotes the .05 level of significance, and a double asterisk the .01 level of significance.

As can be noted by examining the simple correlation coefficients in Table 31a, the significant overall relationships involved the EHC and LL subtests of the KSI. The GM subtest was not significantly related to any of the CRT or WRAT constructs. The moderate, positive validity coefficients between the KSI and the CRT and WRAT scores indicate that a student's performance on one instrument is related to his performance on the other instruments and is an indication that the KSI is an appropriate instrument for screening children for the KPLC program.

3.34 Construct Validity

Some information is also available to assess various aspects of the construct validity of the KSI. This consists primarily of the results of the factor analysis of the KSI items and the results of a factor relating procedure to measure the correspondence of the KSI constructs by sex and ethnic groups.

3.341 Factor Analysis

Principal components factor analyses followed by varimax rotations (see Harman, 1967) were performed on the 28 KSI items for a sample of 1,790 students. A four factor solution seemed to be particularly meaningful, since taking additional factors only resulted in the further division of the gross motor items. As can be seen in Table 32, the first factor is defined by high loadings on all of the eye-hand coordination items and very low loadings on all other items. Item 10, the adequate-inadequate score, is inversely related to factor one because a high score on item 10 indicates inadequate rather than adequate performance. The second factor is defined by moderate to high loadings on the language-learning items and low loadings on all other items. Item 21 is the adequate-inadequate item and is inversely related to high performance on

Table 32

Principal Components Factor Solution

With Varimax Rotation

(N = 1790)

KSI Items	Factors				
	I Eye-Hand Coordination	II Language Learning	III Gross Motor	IV Vision	h^2
Vision 1	-.109	-.088	-.053	.886	807
Vision 2	-.119	-.102	-.015	.884	806
Hearing	-.065	-.070	-.059	.216	059
EHC1	.724	.121	.135	-.067	562
EHC2	.625	.191	-.005	-.088	435
EHC3	.739	.117	.098	-.080	576
EHC4	.610	.071	.178	-.053	412
EHC5	.505	.202	.046	-.035	299
EHC6	.768	.197	.051	-.067	636
EHC7	.753	.234	.063	-.062	630
Adequate	-.822	-.160	-.102	.117	725
LL1	.205	.565	-.006	-.078	367
LL2	.106	.697	.060	-.104	511
LL3	.290	.594	.156	-.119	475
LL4	.070	.524	.098	-.106	300
LL5	.128	.467	.058	-.019	222
LL6	-.002	.461	.057	-.084	223
LL7	.057	.606	.021	.045	373
LL8	.311	.701	.045	-.035	591
LL9	.278	.513	.073	.008	346
Adequate	-.169	-.799	-.121	.074	687
GM1	.075	-.017	.637	-.077	418
GM2	.046	-.010	.616	.002	382
GM3	.097	.185	.584	-.021	385
GM4	.082	.114	.639	-.083	435

GM5	.028	-.001	.363	-.022	133
GM6	.069	.143	.516	-.007	292
Adequate	-.106	-.115	-.851	.031	750
Eigenvalues	6.75	2.39	2.19	1.52	12.85
Percent of Total Variance	15.6	14.1	10.0	6.2	45.9

this language factor. The third factor is defined by moderate to high loadings on all of the gross motor items. The inversely related item is again the adequate-inadequate score. The fourth factor is defined by high loadings on the vision items and low loadings on all other items. The four factor solution produces a particularly clear interpretation. The fact that the items from each subtest loaded highly on the same factor and no other factor supports the conclusion that the KSI measures four factors. These four factors are eye-hand coordination, language-learning, gross motor skill, and vision.

3.342 Correspondence of Constructs by Sex and Ethnic Groups

Alston and Doughtie (1975) also addressed the question of whether the constructs measured by the KSI were the same for both sexes and for different ethnic groups. The factor relating procedure proposed by Kaiser, Hunka and Bianchini (1969) to determine the extent to which the same constructs are being measured for different groups was used. The values obtained, which are presented in Table 33, are interpreted similarly to correlation coefficients. The mean correspondence between the constructs measured by the KSI for males and females was .950. The mean correspondence for the Anglo-American and Negro-American groups was .951. The mean correspondence for the Anglo-American and Mexican-American groups was .856, and for the Negro-American and Mexican-American groups was .887. These values compare favorably with the mean correspondence of .85 reported by Kaiser et al.(1969). Alston and Doughtie concluded that the KSI measures substantially the same constructs for both males and females, and for the Anglo-American, Negro-American and Mexican-American ethnic groups.

These analyses were repeated on a sample of 1,790 students on the 1974-75 version of the KSI. As can be seen in Table 34, the results support the contention that the KSI items measure the same constructs for all sex and ethnic groups.

Table 33

Cosines Between Item Vectors for Sex and Ethnic Groups on the KSI

Kindergarten Screening Inventory	Test Cosines			
	Male-Female	Anglo-Negro	Anglo-Mexican	Negro-Mexican
Vision				
1	9854	8892	9661	9261
2	9774	9570	9717	9470
Hearing				
3	6473	6391	5723	7844
Eye-Hand Coordination				
4	9933	9492	8850	9491
5	9886	8899	8736	9165
6	9925	9901	9709	9714
7	9796	9731	9312	9275
8	9907	9840	9845	9905
9	9931	9729	9832	9798
10	9961	9905	8498	8593
Language Learning				
11	9251	9951	9395	9578
12	9425	9141	8503	7993
13	9758	9925	9779	9789
14	9787	9578	9973	9469
15	9220	9460	9116	9486
16	9379	9122	5943	8190
17	9936	9911	9681	9795
18	9782	9167	8531	9867
19	9832	9850	9839	9802
20	9513	9972	1293	1347
21	9653	9694	6318	7863
Gross Motor				
22	9416	9854	9552	9728
23	8322	9507	9028	9887
24	8861	9415	7695	8544
25	9524	9816	9695	9889
26	9011	9679	9678	9540
27	9694	9917	9739	9849
28	9627	9724	9291	9728
29	9657	9751	9755	9795
30	9626	9837	9512	9176
31	9175	8853	4436	5190
32	9508	9473	7786	8433
33	9949	9941	8031	8304
	$\bar{X}$ = 9495	$\bar{X}$ = 9512	$\bar{X}$ = 8559	$\bar{X}$ = 8871

*Decimals omitted

Table 34

Cosines Between Item Vectors for Sex and Ethnic Groups on the KSI

Kindergarten Screening Inventory	Test Consines			
	Male-Female	Anglo-Negro	Anglo-Mexican	Negro-Mexican
Vision				
1	.9351	.9893	.9086	.9473
2	.9563	.9942	.8881	.9482
Hearing				
3	.7394	.6590	.3968	.0144
Eye-Hand Coordination				
4	.9349	.9240	.8588	.9670
5	.9677	.9322	.9323	.9666
6	.9704	.9349	.8941	.9821
7	.9825	.9078	.8614	.8476
8	.9128	.9084	.6502	.9533
9	.9837	.9498	.8878	.9677
10	.9855	.9807	.9876	.9777
11	.9851	.9804	.9594	.9928
Language Learning				
12	.8261	.9518	.8166	.9194
13	.9661	.8914	.9505	.8916
14	.8552	.9339	.9294	.9260
15	.3958	.8466	.8315	.8964
16	.9777	.8483	.7532	.6979
17	.3693	.6190	.5871	.3553
18	.8556	.8756	.9128	.9551
19	.9623	.9402	.9323	.9455
20	.9393	.9053	.9198	.9020
21	.9784	.9565	.9484	.9921
Gross Motor				
22	.9775	.8959	.8258	.8521
23	.9148	.8530	.7146	.8230
24	.9618	.9216	.9214	.8531
25	.9532	.9638	.8646	.9049
26	.9325	.6031	.9291	.9268
27	.8863	.8518	.9285	.9315
28	.9767	.9745	.9668	.9724
	$\bar{X}$ = .8959	$\bar{X}$ = .8926	$\bar{X}$ = .8556	$\bar{X}$ = .8682

4. ADDITIONAL INFORMATION ON THE KSI

4.1 Referrals by Sex and Ethnic Groups 1974 (Table 35)

4.12 Referrals by Sex and Ethnic Groups 1975 (Table 36)

4.13 Referrals of Mexican American Students Tested in English, Spanish or Both 1975 (Table 37)

4.2 Regression Analyses

4.21 Regression of Items on Total KSI Score 1974 (Table 38)

4.22 Regression of Items on Total KSI Score 1975 (Table 39)

4.23 Regression of EHC Items on Total EHC Score 1974 (Table 40)

4.24 Regression of EHC Items on Total EHC Score 1975 (Table 41)

4.25 Regression of LL Items on Total LL Score 1974 (Table 42)

4.26 Regression of LL Items on Total LL Score 1975 (Table 43)

4.27 Regression of GM Items on Total GM Score 1974 (Table 44)

4.28 Regression of GM Items on Total GM Score 1975 (Table 45)

4.3 Intercorrelation of KSI Factor Defined Subtests (Table 46)

4.4 Intercorrelation of KSI Subtests (Table 47)

4.5 Norms

4.511 Percentiles and Standard Scores of Total Sample on EHC (Table 48)

4.512 Percentiles and Standard Scores of Total Sample on LL (Table 49)

4.513 Percentiles and Standard Scores of Total Sample on GM (Table 50)

4.521 Percentiles and Standard Scores of Males on EHC (Table 51)

4.522 Percentiles and Standard Scores of Males on LL (Table 52)

4.523 Percentiles and Standard Scores of Males on GM (Table 53)

4.531 Percentiles and Standard Scores of Females on EHC (Table 54)

4.532 Percentiles and Standard Scores of Females on LL (Table 55)

4.533 Percentiles and Standard Scores of Females on GM (Table 56)

4.541 Percentiles and Standard Scores of Anglo American Males on EHC (Table 57)

4.542 Percentiles and Standard Scores of Anglo American Males on LL (Table 58)

4.543 Percentiles and Standard Scores of Anglo American Males on GM (Table 59)

4.551 Percentiles and Standard Scores of Anglo American Females on EHC (Table 60)

4.552 Percentiles and Standard Scores of Anglo American Females on LL (Table 61)

4.553 Percentiles and Standard Scores of Anglo American Females on GM (Table 62)

4.561 Percentiles and Standard Scores of Mexican American Males on EHC (Table 63)

4.562 Percentiles and Standard Scores of Mexican American Males on LL (Table 64)

4.563 Percentiles and Standard Scores of Mexican American Males on GM (Table 65)

4.571 Percentiles and Standard Scores of Mexican American Females on EHC (Table 66)

4.572 Percentiles and Standard Scores of Mexican American Females on LL (Table 67)

4.573 Percentiles and Standard Scores of Mexican American Females on GM (Table 68)

4.581 Percentiles and Standard Scores of Black American Males on EHC (Table 69)

4.582 Percentiles and Standard Scores of Black American Males on LL (Table 70)

4.583 Percentiles and Standard Scores of Black American Males on GM (Table 71)

4.591 Percentiles and Standard Scores of Black American Females on EHC (Table 72)

4.592 Percentiles and Standard Scores of Black American Females on LL (Table 73)

4.593 Percentiles and Standard Scores of Black American Females on GM (Table 74)

Norms are provided for the sample of 1,790 kindergarten students and for each sex and ethnic group so that a student's performance on the EHC, LL or GM subtests could be compared with HISD kindergarten students in general or with students from his sex or ethnic group. The subtest scores are based on the sum of the items in each subtest with the exception of the adequate-inadequate items and the language used item of the LL subtest.

Percentiles and standard scores are provided for each raw score. The percentile score associated with a particular raw score indicates the percentage of students in the sample who obtained the same or a lower score. For example, as can be seen in Table 48 a student who achieved a raw score of 23 on EHC would have scored higher than 59 percent of the other students in the sample. The standard score associated with a particular raw score is the T score. T score distributions are calculated so that they have a mean of 50 and a standard deviation of 10. Since the distributions of raw scores are somewhat skewed, standard scores on one distribution can not be compared with standard scores, at the extremes of the distribution, on another distribution. Nonetheless, the use of standard scores facilitates

the interpretation of a raw score relative to the mean of the distribution.

4.6 Needed Research

4.61 Predictive Validity

The most pressing need for the Kindergarten Screening Instrument is validity information. Houston Independent School District is large (170 elementary schools) and has an extremely high intra-district mobility rate which has rendered follow-up data on students who have taken the KSI extremely difficult to obtain. With the newly initiated system of identification numbers, follow-up data on students should be more available. Follow-up data should be collected on the performance of a fairly large representative sample of students for the first three years of elementary school. These data would permit the evaluation of criterion related predictive validity of the KSI.

Performance on the KSI should be compared with performance on all standardized tests administered to any reasonably large group of students in the first, second and third grades (e.g., Metropolitan Reading Readiness Test, Iowa Test of Basic Skills, etc.).

Performance on the KSI should be compared with teacher ratings of EHC, LL, GM and general academic achievement for a sample of students in the first and second grade.

Performance of students on the KSI along with kindergarten students' scores on several other instruments (e.g., Cartoon Conservation Scale and/or the Meeker Structure of Intellect Test) should be compared in their ability to predict academic achievement in the first three grades as measured by standardized tests (e.g., Metropolitan Reading Readiness Test or Iowa Test of Basic Skills) and teacher ratings of academic achievement.

4.62 Concurrent Validity

The performance on the KSI should be compared with performance on all standardized tests currently being administered to any large (e.g., 200 or more) group of students in kindergarten. Performance on the KSI should be compared with teacher ratings of Eye-Hand Coordination (EHC), Language Learning (LL), Gross-Motor (GM) skills, and general academic achievement for a sample of students. Performance on the KSI vision and hearing items should be compared with nurses' ratings of vision and hearing for a sample of students. A sample of students should be administered other instruments at approximately the same time as the KSI administration (e.g., the Cartoon Conservation Scale by DeAvila as a measure of Piagetian constructs or Meeker's Structure of Intellect test as a measure of mental abilities as defined by Guilford's Structure of Intellect model). The performance on these tests should be compared with performance on the KSI.

4.63 Experimental Studies

A stratified (by ethnic group) random sample of kindergarten students (regardless of whether they scored adequate or inadequate on the KSI) should be assigned to experimental and control groups. The experimental group should be administerd six weeks of training as outlined in "Follow-up Activities for the HISD KSI" by their kindergarten teachers. The control group should receive the usual kindergarten program. The students should be posttested on the KSI at the end of the six-week training program. In addition, teacher ratings of academic achievement should be obtained before and after the training program. The questions to be addressed are: Does six weeks of kindergarten instruction raise scores on the KSI? Does a

training program oriented toward the KSI result in greater gains on the KSI than the general training program? Does the special training program result in higher ratings of academic achievement than the regular kindergarten program?

The same procedures should be followed in a second study with the exceptions that (a) Meeker's Structure of Intellect test should be administered pre and post, as well as the KSI, and (b) the treatment would consist of exercises related to the Meeker test rather than the KSI. The question to be addressed is: Does improvement on the Meeker tasks, as measured by the Meeker test, generalize; that is, does performance on the KSI increase if students are given Meeker's exercises?

These or similar studies should be sufficient to determine whether the KSI measures constructs which are related to other measures of academic achievement. More specific questions may be addressed as they arise.

Table 35

Referrals on 1974 KSI*

Scale	% Referred	% Referred		% Referred				% of Referred Group		% of Referred Group			
		Male	Female	AA	MA	NA	O	Male	Female	AA	MA	NA	O
Right Eye	16.8	8.8	8.0	4.2	4.7	7.6	0.2	52.2	47.8	25.2	28.3	45.5	0.9
Left Eye	16.1	8.7	7.5	4.1	4.6	7.5	0.1	53.7	46.3	25.0	28.0	46.1	0.8
Hearing	5.8	3.1	2.7	1.3	1.3	2.9	0.1	53.1	46.9	23.2	23.9	51.4	1.4
Eye-Hand Coordination	27.0	15.0	12.1	5.2	5.7	16.3	0.1	55.4	44.6	19.2	20.8	59.6	0.4
Language Learning	8.9	5.2	3.7	0.8	4.2	3.9	0.1	58.6	41.4	8.8	46.5	43.3	1.4
Gross Motor	18.2	10.5	7.7	8.3	3.8	5.9	0.1	57.6	42.3	45.9	20.9	32.3	0.7

*Referrals are based on the total sample of 11,079 minus missing data.

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Table 36

Referrals on 1975 KSI

By Sex and Ethnic Group

Scale	% Referred	% Referred		% of Referred Group		% Referred							
		Male	Female	Male	Female	AA		MA		NA		O	
						M	F	M	F	M	F	M	F
Right Eye	15.6	8.5	7.1	54.5	45.5	6.9	4.7	8.7	7.2	9.9	8.9	3.9	4.5
Left Eye	15.5	8.3	7.2	53.5	46.5	5.9	4.6	9.0	7.3	9.7	8.9	4.5	7.1
Hearing	4.8	2.4	2.4	50.3	49.7	1.7	2.0	3.1	3.0	2.6	2.4	0.7	1.3
Eye-Hand Coordination	26.1	14.0	12.1	53.7	46.3	7.8	5.6	11.8	9.3	20.3	18.7	6.0	7.3
Language Learning	19.1	10.5	8.6	55.0	45.0	3.8	1.9	16.6	13.5	12.0	10.4	11.5	11.5
Gross Motor	21.5	11.2	10.3	52.1	47.8	14.4	11.3	11.6	10.6	8.4	9.2	11.7	13.0

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Table 37

Percentage of Mexican American Students Referred

When Tested in English, Spanish or Both*

Scale	Percentage Referred		
	English	Spanish	Both
	N=304	N=68	N=42
Right Eye	16.1	10.3	11.9
Left Eye	14.5	13.2	11.9
Hearing	4.3	5.9	0.0
EHC	21.1	26.5	31.0
LL	26.3	42.6	45.2
GM	22.0	25.0	40.5

*These percentages are based on the Mexican American students (N=414) included in the random sample of 1790 students on whom most analyses were conducted.

Table 38

Stepwise Regression Analysis of KSI

Items on Total KSI Score
1974
(N = 1538)

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Account For	% of Total Variance Accounted For By Each Additional Item
1	EHC6	.610	.6099	37.20	37.20
2	L3	.599	.7362	54.20	17.00
3	GM5	.453	.8018	64.28	10.08
4	EHC3	.595	.8430	71.06	6.78
5	GM2	.375	.8811	77.63	6.56
6	L9	.523	.9085	82.53	4.90
7	GM7	.424	.9253	85.62	3.09
8	L7	.452	.9378	87.94	2.32
9	EHC1	.532	.9472	89.71	1.77
10	GM4	.343	.9559	91.38	1.66
11	EHC4	.515	.9623	92.61	1.23
12	L5	.370	.9687	93.84	1.24
13	EHC2	.513	.9735	94.77	0.92
14	L4	.419	.9780	95.65	0.88
15	GM1	.402	.9819	96.42	0.77
16	GM6	.197	.9853	97.08	0.66
17	L1	.410	.9886	97.73	0.65
18	GM3	.395	.9914	98.29	0.56
19	EHC5	.593	.9940	98.81	0.52
20	L2	.389	.9966	99.31	0.50
21	L8	.507	.9985	99.69	0.38
22	L6	.327	1.0000	100.00	0.31

Table 39

Stepwise Regression Analysis of KSI

Items on Total KSI Score

1975

(N = 1790)

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Account For	% of Total Variance Accounted For By Each Additional Item
1	EHC7	.665	.6648	44.20	44.20
2	LL11	-.602	.7889	62.24	18.03
3	GM3	.449	.8422	70.93	8.70
4	EHC3	.601	.8735	76.31	5.37
5	GM6	.393	.8959	80.27	3.96
6	LL	.634	.9135	83.44	3.18
7	GM2	.317	.9275	86.02	2.58
8	EHC4	.536	.9385	88.08	2.06
9	LL3	.620	.9475	89.78	1.70
10	LL9	.527	.9555	91.30	1.52
11	EHC2	.534	.9615	92.46	1.16
12	GM5	.228	.9673	93.57	1.12
13	GM4	.409	.9717	94.42	.85
14	EHC5	.492	.9760	95.26	.84
15	LL5	.409	.9799	96.03	.77
16	LL2	.514	.9837	96.76	.73
17	EHC6	.646	.9870	97.42	.67
18	GM1	.337	.9899	98.00	.57
19	LL7	.402	.9927	98.54	.54
20	EHC1	.599	.9949	98.98	.44
21	LL4	.421	.9969	99.37	.39
22	LL6	.319	.9986	99.72	.35
23	LL1	.470	1.0000	100.00	.28

Table 40

Stepwise Regression Analysis of

EHC Items on Total EHC Score
1974
(N = 1538)

Eye Hand Coordination

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Accounted For	% of Total Variance Accounted For By Each Additional Item
1	EHC 3	.785	.7850	61.62	61.62
2	EHC 6	.770	.9004	81.08	19.45
3	EHC 4	.660	.9405	88.46	7.38
4	EHC 1	.719	.9686	93.82	5.37
5	EHC 2	.632	.9878	97.58	3.76
6	EHC 5	.744	1.0000	100.00	2.42

Table 41

Stepwise Regression Analysis of

EHC Items on Total EHC Score
1975
(N = 1790)

Eye Hand Coordination

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Accounted For	% of Total Variance Accounted For By Each Additional Item
1	EHC 7	.789	.7892	62.28	62.28
2	EHC 3	.757	.8916	79.49	17.21
3	EHC 4	.664	.9347	87.36	7.87
4	EHC 2	.665	.9607	92.30	4.94
5	EHC 6	.787	.9780	95.64	3.34
6	EHC 5	.579	.9897	97.95	2.31
7	EHC 1	.731	1.0000	100.00	2.05

Table 42

Stepwise Regression Analysis of

LL Items on Total LL Score
1974
(N = 1538)

Language Learning

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Accounted For	% of Total Variance Accounted For By Each Additional Item
1	L4	.692	.6917	47.84	47.84
2	L8	.646	.8315	69.15	21.30
3	L6	.574	.8945	80.01	10.87
4	L5	.568	.9278	86.09	6.08
5	L3	.604	.9546	91.13	5.04
6	L9	.641	.9719	94.46	3.33
7	L2	.597	.9856	97.15	2.69
8	L7	.488	.9967	99.34	2.19
9	L1	-.265	1.0000	100.00	0.66

Table 43

Stepwise Regression Analysis of

LL Items on Total LL Scores
1974
(N = 1790)

Language Learning

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Accounted For	% of Total Variance Accounted For By Each Additional Item
1	LL8	.765	.7647	58.48	58.48
2	LL3	.693	.8503	72.30	13.82
3	LL9	.629	.8976	80.58	8.28
4	LL2	.678	.9320	86.86	6.29
5	LL5	.534	.9575	91.68	4.81
6	LL7	.568	.9736	94.78	3.11
7	LL4	.543	.9840	96.83	2.05
8	LL6	.442	.9930	98.60	1.77
9	LL1	.587	1.0000	100.00	1.40

Table 44

Stepwise Regression Analysis of

GM Items on Total GM Score
1974
(N = 1538)

Gross Motor

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Accounted For	% of Total Variance Accounted For By Each Additional Item
1	GM 2	.641	.6405	41.03	41.03
2	GM 5	.625	.8211	67.42	26.40
3	GM 7	.569	.8978	80.61	13.19
4	GM 4	.574	.9389	88.16	7.55
5	GM 6	.356	.9640	92.93	4.78
6	GM 1	.596	.9852	97.06	4.12
7	GM 3	.618	1.0000	100.00	2.94

Table 45

Stepwise Regression Analysis of

GM Items on Total GM Score
1975
(N = 1790)

Gross Motor

Step	Item	Simple Correlation	Multiple Correlation	% of Total Variance Accounted For	% of Total Variance Accounted For By Each Additional Item
1	GM 3	.651	.6510	42.38	42.38
2	GM 6	.612	.8178	66.88	24.50
3	GM 1	.590	.9101	82.83	15.95
4	GM 5	.437	.9503	90.30	7.47
5	GM 2	.590	.9776	95.56	5.27
6	GM 4	.607	1.0000	100.00	4.44

Table 46

Intercorrelation of KSI

Factor Defined Subtests

Factors	I Eye-Hand Coordination	II Language Learning	III Gross Motor	IV Laterality	V Vision
I	1.000				
II	.452	1.000			
III	.232	.228	1.000		
IV	-.008	-.021	-.045	1.000	
V	-.232	-.225	-.132	.014	1.000

Table 47

Intercorrelation of KSI Subtests

Subtests	1 Eye-Hand Coordination	2 Language Learning	3 Gross Motor
1	1.000		
2	.452	1.000	
3	.228	.222	1.000

Table 48

Percentiles and Standard Scores for Sample of

Total Group on Eye-Hand Coordination

N = 1770

Raw Score	Percentile	Standard Score
0	1	23
1	1	24
2	1	26
3	1	27
4	2	28
5	4	30
6	5	31
7	7	32
8	9	33
9	10	35
10	12	36
11	13	37
12	15	39
13	18	40
14	21	41
15	24	43
16	28	44
17	32	45
18	36	47
19	40	48
20	45	49
21	50	50
22	54	52
23	59	53
24	64	54
25	70	56
26	74	57
27	79	58
28	84	60
29	88	61
30	91	62
31	94	64
32	96	65
33	98	66
34	99	67
35	99	69

Mean Raw Score = 20.26

Standard Deviation = 7.64

Table 49

Percentiles and Standard Scores for Sample of

Total Group on Language Learning

N = 1770

Raw Score	Percentile	Standard Score
2	1	7
4	1	10
5	1	11
8	1	16
9	1	17
10	1	18
11	1	20
12	1	21
13	1	23
14	2	24
15	2	26
16	3	27
17	3	28
18	4	30
19	5	31
20	6	33
21	8	34
22	10	36
23	12	37
24	14	38
25	16	40
26	19	41
27	23	43
28	27	44
29	31	46
30	36	47
31	42	48
32	47	50
33	52	51
34	57	53
35	63	54
36	69	56
37	76	57
38	81	58
39	86	60
40	90	61
41	93	63
42	96	64
43	98	65
44	99	67
45	99	68
46	99	70
47	99	71

Mean Raw Score = 31.78

Standard Deviation = 7.03

Table 50

Percentiles and Standard Scores for Sample of

Total Group on Gross Motor

N = 1770

Raw Score	Percentile	Standard Score
0	1	21
1	1	23
2	1	25
3	1	26
4	2	28
5	3	30
6	5	32
7	7	34
8	10	35
9	12	37
10	16	39
11	20	41
12	25	42
13	30	44
14	35	46
15	41	48
16	47	49
17	53	51
18	60	53
19	66	55
20	73	57
21	78	58
22	84	60
23	89	62
24	93	64
25	96	65
26	98	67
27	99	69

Mean Raw Score = 16.03

Standard Deviation = 5.66

Table 51

Percentiles and Standard Scores for Sample of

Males on Eye-Hand Coordination

N = 894

Raw Score	Percentile	Standard Score
0	1	25
1	1	26
2	1	27
3	2	28
4	3	30
5	5	31
6	7	32
7	9	34
8	11	35
9	12	36
10	14	37
11	16	39
12	18	40
13	20	41
14	23	42
15	27	44
16	31	45
17	35	46
18	39	47
19	44	49
20	49	50
21	53	51
22	58	52
23	62	54
24	67	55
25	72	56
26	76	57
27	80	59
28	84	60
29	87	61
30	91	63
31	94	64
32	96	65
33	98	66
34	99	68
35	99	69

Mean Raw Score = 19.67

Standard Deviation = 7.93

Table 52

Percentiles and Standard Scores for Sample of

Males on Language Learning

N = 894

Raw Score	Percentile	Standard Score
4	1	11
5	1	12
8	1	16
9	1	18
10	1	19
11	1	21
12	1	22
13	1	23
14	2	25
15	2	26
16	3	28
17	4	29
18	4	31
19	6	32
20	7	33
21	8	35
22	10	36
23	12	38
24	15	39
25	18	40
26	21	42
27	25	43
28	29	45
29	34	46
30	38	48
31	44	49
32	50	50
33	54	52
34	60	53
35	65	55
36	72	56
37	78	57
38	83	59
39	87	60
40	90	62
41	93	63
42	96	64
43	98	66
44	99	67
45	99	69
46	99	70

Mean Raw Score = 31.41

Standard Deviation = 7.07

Table 53

Percentiles and Standard Scores for Sample of

Males on Gross Motor

N = 894

Raw Score	Percentile	Standard Score
0	1	21
1	1	22
2	1	24
3	1	26
4	2	28
5	3	30
6	5	31
7	7	33
8	9	35
9	12	37
10	15	38
11	19	40
12	25	42
13	30	44
14	35	46
15	40	47
16	46	49
17	51	51
18	58	53
19	65	54
20	72	56
21	78	58
22	83	60
23	89	62
24	93	63
25	96	65
26	98	67
27	99	69

Mean Raw Score = 16.21

Standard Deviation = 5.61

Table 54

Percentiles and Standard Scores for Sample of

Females on Eye-Hand Coordination

N = 876

Raw Score	Percentile	Standard Score
0	1	21
1	1	22
2	1	24
3	1	25
4	2	26
5	3	28
6	4	29
7	5	30
8	6	32
9	8	33
10	9	35
11	11	36
12	13	37
13	15	39
14	18	40
15	21	41
16	25	43
17	29	44
18	33	46
19	37	47
20	41	48
21	46	50
22	51	51
23	56	52
24	62	54
25	68	55
26	73	57
27	78	58
28	83	59
29	88	61
30	92	62
31	94	63
32	96	65
33	98	66
34	99	68
35	99	69

Mean Raw Score = 20.86

Standard Deviation = 7.29

Table 55

Percentiles and Standard Scores for Sample of Females on Language Learning

N = 876

Raw Score	Percentile	Standard Score
2	1	6
5	1	10
8	1	15
9	1	16
10	1	18
11	1	19
12	1	21
13	1	22
14	1	23
15	2	25
16	2	26
17	3	28
18	4	29
19	5	31
20	6	32
21	7	33
22	9	35
23	11	36
24	12	38
25	14	39
26	18	41
27	21	42
28	25	44
29	29	45
30	34	46
31	39	48
32	44	49
33	49	51
34	55	52
35	60	54
36	66	55
37	73	56
38	80	58
39	85	59
40	89	61
41	93	62
42	96	64
43	97	65
44	98	67
45	99	68
46	99	69
47	99	71

Mean Raw Score = 32.16

Standard Deviation = 6.97

Table 56

Percentiles and Standard Scores for Sample of

Females on Gross Motor

N = 876

Raw Score	Percentile	Standard Score
0	1	22
1	1	23
2	1	25
3	2	27
4	3	29
5	4	30
6	6	32
7	8	34
8	11	36
9	13	37
10	17	39
11	20	41
12	25	43
13	29	44
14	35	46
15	42	48
16	49	50
17	55	52
18	62	53
19	68	55
20	73	57
21	79	59
22	84	60
23	89	62
24	94	64
25	97	66
26	99	67
27	99	69

Mean Raw Score = 15.86

Standard Deviation = 5.71

Table 57

Percentiles and Standard Scores for Sample of

Anglo American Males on Eye-Hand Coordination

N = 322

Raw Score	Percentile	Standard Score
4	1	20
5	1	22
6	2	23
7	2	25
8	3	26
10	3	29
11	4	31
12	5	32
13	7	34
14	9	36
15	12	37
16	15	39
17	19	40
18	21	42
19	25	43
20	31	45
21	36	46
22	41	48
23	46	50
24	52	51
25	57	53
26	62	54
27	68	56
28	75	57
29	80	59
30	86	60
31	93	62
32	96	64
33	98	65
34	99	67
35	99	68

Mean Raw Score = 22.98

Standard Deviation = 6.45

Table 58

Percentiles and Standard Scores for Sample of

Anglo American Males on Language Learning

N = 322

Raw Score	Percentile	Standard Score
10	1	7
15	1	16
16	1	18
17	1	19
19	1	23
20	2	25
21	2	26
22	3	28
23	4	30
24	5	32
25	6	33
26	8	35
27	11	37
28	14	39
29	17	40
30	21	42
31	27	44
32	32	46
33	37	47
34	42	49
35	49	51
36	58	53
37	66	54
38	74	56
39	80	58
40	84	60
41	89	61
42	93	63
43	96	65
44	98	67
45	99	68

Mean Raw Score = 34.24

Standard Deviation = 5.74

Table 59

Percentiles and Standard Scores for Sample of Anglo American Males on Gross Motor

N = 322

Raw Score	Percentile	Standard Score
2	1	26
3	1	28
4	2	30
5	4	31
6	7	33
7	10	35
8	14	37
9	17	39
10	20	40
11	24	42
12	30	44
13	35	46
14	40	48
15	47	49
16	55	51
17	61	53
18	66	55
19	72	57
20	79	58
21	85	60
22	89	62
23	93	64
24	96	66
25	98	67
26	99	69
27	99	71

Mean Raw Score = 15.05

Standard Deviation = 5.59

Table 60

Percentiles and Standard Scores for Sample of

Anglo American Females on Eye-Hand Coordination

N = 305

Raw Score	Percentile	Standard Score
1	1	12
4	1	17
5	1	18
7	2	22
9	2	25
10	3	27
11	3	28
12	4	30
13	5	32
14	6	33
15	8	35
16	10	36
17	13	38
18	17	40
19	20	41
20	25	43
21	28	45
22	32	46
23	37	48
24	43	50
25	51	51
26	58	53
27	65	54
28	73	56
29	80	58
30	85	59
31	89	61
32	93	63
33	96	64
34	98	66
35	99	68

Mean Raw Score = 23.99

Standard Deviation = 6.12

Table 61

Percentiles and Standard Scores for Sample of

Anglo American Females on Language Learning

N = 305

Raw Score	Percentile	Standard Score
2	1	1
18	1	16
22	1	23
23	2	25
25	2	29
26	4	31
27	6	33
28	8	35
29	10	37
30	14	39
31	19	41
32	24	43
33	29	45
34	35	47
35	41	49
36	48	51
37	58	53
38	67	55
39	76	57
40	83	59
41	89	61
42	93	62
43	96	64
44	99	66

Mean Raw Score = 35.37

Standard Deviation = 5.13

Table 62

Percentiles and Standard Scores for Sample of

Anglo American Females on Gross Motor

N = 305

Raw Score	Percentile	Standard Score
0	1	22
1	1	24
3	1	27
4	2	29
5	3	31
6	5	32
7	8	34
8	11	36
9	14	38
10	18	40
11	23	41
12	28	43
13	33	45
14	39	47
15	44	49
16	49	50
17	56	52
18	64	54
19	71	56
20	76	57
21	80	59
22	86	61
23	91	63
24	95	65
25	98	66
26	99	68

Mean Raw Score = 15.55

Standard Deviation = 5.61

Table 63

Percentiles and Standard Scores for Sample of

Mexican American Males on Eye-Hand Coordination

N = 213

Raw Score	Percentile	Standard Score
2	1	26
3	1	27
4	3	28
5	5	30
6	6	31
7	6	32
8	7	33
9	9	35
10	11	36
11	13	37
12	15	38
13	17	40
14	20	41
15	24	42
16	29	43
17	32	45
18	34	46
19	37	47
20	42	49
21	47	50
22	53	51
23	58	52
24	62	54
25	67	55
26	72	56
27	76	57
28	81	59
29	84	60
30	87	61
31	90	62
32	93	64
33	96	65
34	97	66
35	99	67

Mean Raw Score = 20.79

Standard Deviation = 7.94

Table 64

Percentiles and Standard Scores for Sample of

Mexican American Males on Language Learning

N = 213

Raw Score	Percentile	Standard Score
4	1	17
10	1	25
11	1	26
12	2	28
13	3	29
14	4	30
15	5	32
16	6	33
17	7	34
18	8	35
19	11	37
20	14	38
21	16	39
22	19	41
23	23	42
24	28	43
25	31	45
26	34	46
27	38	47
28	42	48
29	47	50
30	53	51
31	59	52
32	63	54
33	67	55
34	72	56
35	77	57
36	82	59
37	85	60
38	88	61
39	92	63
40	93	64
41	95	65
42	96	67
43	98	68
44	99	69
46	99	72

Mean Raw Score = 28.85

Standard Deviation = 7.75

Table 65

Percentiles and Standard Scores for Sample of

Mexican American Males on Gross Motor

N = 213

Raw Score	Percentile	Standard Score
3	1	25
4	1	26
5	2	28
6	3	30
7	4	32
8	5	34
9	8	36
10	12	37
11	17	39
12	24	41
13	29	43
14	34	45
15	40	47
16	45	48
17	50	50
18	56	52
19	64	54
20	70	56
21	76	57
22	82	59
23	87	61
24	90	63
25	93	65
26	96	67
27	99	68

Mean Raw Score = 16.64

Standard Deviation = 5.50

Table 66

Percentiles and Standard Scores for Sample of Mexican American Females on Eye-Hand Coordination

N = 201

Raw Score	Percentile	Standard Score
2	1	20
4	1	23
5	2	25
6	2	26
8	3	29
9	4	31
10	5	32
11	6	34
12	8	35
13	10	37
14	14	38
15	18	40
16	22	41
17	26	43
18	29	44
19	33	46
20	37	47
21	41	49
22	47	50
23	53	51
24	59	53
25	65	54
26	71	56
27	76	57
28	81	59
29	87	60
30	91	62
31	94	63
32	97	65
33	98	66
34	99	68
35	99	69

Mean Raw Score = 21.66

Standard Deviation = 6.75

Table 67

Percentiles and Standard Scores for Sample of

Mexican American Females on Language Learning

N = 201

Raw Score	Percentile	Standard Score
8	1	21
12	1	26
13	2	28
15	2	30
16	3	32
17	4	33
18	7	34
19	10	36
20	13	37
21	16	38
22	19	40
23	21	41
24	24	42
25	29	44
26	33	45
27	37	46
28	41	48
29	47	49
30	53	50
31	59	52
32	63	53
33	67	54
34	72	56
35	77	57
36	81	58
37	84	60
38	88	61
39	91	62
40	93	64
41	95	65
42	96	66
43	97	68
45	98	70
46	99	72
47	99	73

Mean Raw Score = 29.28

Standard Deviation = 7.53

Table 68

Percentiles and Standard Scores for Sample of Mexican American Females on Gross Motor

N = 201

Raw Score	Percentile	Standard Score
0	1	26
1	1	27
2	1	29
3	3	31
4	5	32
5	6	34
6	10	35
7	14	37
8	[illegible]	39
9	20	40
10	23	42
11	27	43
12	31	45
13	36	46
14	41	48
[illegible]	47	50
16	57	51
17	65	53
18	69	54
19	73	56
20	77	58
21	81	59
22	84	61
23	87	62
24	92	64
25	96	66
26	98	67
27	99	69

Mean Raw Score = 14.90

Standard Deviation = 6.29

Table 69

Percentiles and Standard Scores for Sample of

Black American Males on Eye-Hand Coordination

N = 359

Raw Score	Percentile	Standard Score
0	1	28
1	1	30
2	2	31
3	3	32
4	5	34
5	8	35
6	12	36
7	17	38
8	21	39
9	23	40
10	26	42
11	28	43
12	30	44
13	34	46
14	37	47
15	42	48
16	47	49
17	53	51
18	59	52
19	64	53
20	69	55
21	73	56
22	76	57
23	79	59
24	83	60
25	88	61
26	91	63
27	92	64
28	94	65
29	96	66
30	97	68
31	98	69
32	99	70
33	99	72
35	99	74

Mean Raw Score = 16.04

Standard Deviation = 7.65

Table 70

Percentiles and Standard Scores for Sample of

Black American Males on Language Learning

N = 359

Raw Score	Percentile	Standard Score
5	1	13
8	1	17
9	1	18
10	1	20
13	2	24
14	2	26
15	2	27
16	3	29
17	4	30
18	5	31
19	6	33
20	7	34
21	8	36
22	11	37
23	13	39
24	16	40
25	20	42
26	25	43
27	29	45
28	34	46
29	40	47
30	45	49
31	51	50
32	57	52
33	62	53
34	68	55
35	73	56
36	79	58
37	83	59
38	87	61
39	90	62
40	93	64
41	96	65
42	97	66
43	99	68
44	99	69
46	99	72

Mean Raw Score = 30.39

Standard Deviation = 6.88

Table 71

Percentiles and Standard Scores for Sample of

Black American Males on Gross Motor

N = 359

Raw Score	Percentile	Standard Score
0	1	19
1	1	21
2	1	22
3	1	24
4	1	26
5	3	28
6	4	30
7	6	31
8	7	33
9	9	35
10	12	37
11	16	39
12	20	40
13	25	42
14	30	44
15	34	46
16	38	48
17	44	50
18	52	51
19	59	53
20	66	55
21	73	57
22	79	59
23	86	60
24	92	62
25	95	64
26	98	66
27	99	68

Mean Raw Score = 16.99

Standard Deviation = 5.54

Table 72

Percentiles and Standard Scores for Sample of

Black American Females on Eye-Hand Coordination

N = 370

Raw Score	Percentile	Standard Score
0	1	25
2	1	28
3	2	29
4	4	30
5	6	32
6	7	33
7	9	35
8	12	36
9	14	37
10	16	39
11	19	40
12	23	41
13	26	43
14	30	44
15	34	46
16	38	47
17	43	48
18	48	50
19	52	51
20	57	52
21	63	54
22	68	55
23	73	57
24	78	58
25	83	59
26	86	61
27	89	62
28	93	63
29	96	65
30	97	66
31	98	68
32	99	69
33	99	70
35	99	73

Mean Raw Score = 17.85

Standard Deviation = 7.28

Table 73

Percentiles and Standard Scores for Sample of

Black American Females on Language Learning

N = 370

Raw Score	Percentile	Standard Score
5	1	12
9	1	18
10	1	19
11	1	21
13	2	24
14	2	25
15	2	26
16	3	28
17	4	29
18	5	31
19	6	32
20	7	34
21	8	35
22	10	36
23	12	38
24	14	39
25	17	41
26	21	42
27	26	44
28	30	45
29	35	47
30	41	48
31	46	49
32	50	51
33	55	52
34	62	54
35	67	55
36	73	57
37	80	58
38	86	59
39	89	61
40	93	62
41	96	64
42	97	65
43	99	67
44	99	68
45	99	70
46	99	71

Mean Raw Score = 31.07

Standard Deviation = 6.96

Table 74

Percentiles and Standard Scores for Sample of

Black American Females on Gross Motor

N = 370

Raw Score	Percentile	Standard Score
1	1	20
2	1	22
3	1	24
4	2	26
5	3	28
6	4	30
7	6	32
8	7	33
9	9	35
10	12	37
11	15	39
12	19	41
13	23	43
14	29	45
15	37	46
16	44	48
17	50	50
18	57	52
19	63	54
20	69	56
21	76	58
22	83	60
23	89	61
24	94	63
25	96	65
26	99	67
27	99	69

Mean Raw Score = 16.63

Standard Deviation = 5.36

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Appendix

RATING SCALE FOR KINDERGARTEN STUDENTS

Student's Behavior Manifested with following frequency:

AREA	1 Very frequently	2 Often	3 Sometimes	4 Infrequently	5 Very Rarely	SCORE
VISION						
1) Holds paper very close to face						
2) Cannot see blackboard						
3) Squints						
4) Has difficulty focusing eyes on object						
5) Appears to have had visual problem						
			Total Score--Vision			
HEARING						
1) Does not hear name called						
2) Does not hear directions given						
3) Does not come when called						
4) Must be shown rather than told						
5) Appears to have had a hearing problem						
			Total Score--Hearing			

RATING SCALE FOR KINDERGARTEN STUDENTS - Page 2

Student's Behavior Manifested with following frequency:

AREA	1 Very frequently	2 Often	3 Sometimes	4 Infrequently	5 Very Rarely	SCORE
FINE MOTOR						
1) Has difficulty holding pencil						____
2) Colors very poorly						____
3) Has poor use of scissors						____
4) Has difficulty writing						____
5) Has difficulty drawing						____
6) Drops small objects						____
7) Has difficulty with shoelaces, zippers, and buttons						____
8) Has difficulty manipulating tools and small objects						____
					Total Score--Fine Motor	____

RATING SCALE FOR KINDERGARTEN STUDENTS - Page 3

AREA	Student's Behavior Manifested with following frequency: 1 Very frequently	2 Often	3 Sometimes	4 Infrequently	5 Very Rarely	SCORE
LANGUAGE						
1) Difficult to understand						
2) Does not talk in sentences						
3) Usually uses single words or phrases to communicate						
4) Does not know names of common objects						
5) Speaks rarely						
6) Does not understand simple comparisons						
7) Hears but does not understand directions						
8) Uses only simple linguistic phrase structure						
			Total Score--Language			

RATING SCALE FOR KINDERGARTEN STUDENTS - Page 4

Student's Behavior Manifested with following frequency:

AREA	1 Very frequently	2 Often	3 Sometimes	4 Infrequently	5 Very Rarely	SCORE
GROSS MOTOR						
1) Bumps into chairs, desks and other objects						____
2) Has difficulty with steps and stairs						____
3) Trips						____
4) Appears clumsy and awkward						____
5) Does very poorly in physical games and activities						____
6) Walks on the balls and toes of feet with springing gait						____
			Total Score--Gross Motor			____

READINESS RATING	1 No	2 Undecided	3 Yes
Is the child ready for Kindergarten			

If the child is rated 1 (No), give reason.

_____

_____

_____

TOTAL SCORE ____

NAME _____

TEACHER _____

SCHOOL _____

DATE _____